

## CLAIMS

1. An electric motor movement controlling method, the electric motor being fed by a total voltage ( $V_T$ ) proportional to a network voltage ( $V_{AC}$ ),

5 the method being characterized by comprising the steps of:

- making a first measurement of level ( $V_{t10}$ ) of the network voltage ( $V_{AC}$ ) at a first moment of measurement ( $t1_0$ );

- making a second measurement of level ( $V_{t20}$ ) of the network voltage ( $V_{AC}$ ) at a second moment of measurement ( $t2_0$ );

10 - calculating the value of the derivative of the voltage values measured in function of the first and second moments of measurement ( $t1_0$ ,  $t2_0$ ), to obtain a value of a proportional network voltage ( $V_{AC}'$ ); and

- altering the value of the total voltage ( $V_T$ ) fed to the motor, proportionally to the value of the proportional network voltage ( $V_{AC}'$ ).

15 2. A method according to claim 1, characterized in that the value of the total voltage ( $V_T$ ) is altered in function of the difference between the value of the proportional network voltage ( $V_{AC}'$ ) calculated in a present cycle of the network voltage ( $V_{AC}$ ) and the value of the proportional network voltage ( $V_{AC}'$ ) calculated in the previous cycle of the network voltage ( $V_{AC}$ ).

20 3. A method according to claim 1, characterized in that the value of the total voltage ( $V_T$ ) is altered in function of the difference between the value of the proportional network voltage ( $V_{AC}'$ ) calculated in a current semi-cycle of the network voltage ( $V_{AC}$ ) and the value of the proportional network voltage ( $V_{AC}'$ ) calculated in the previous semi-cycle of the network voltage ( $V_{AC}$ ).

25 4. A method according to claim 2 or 3, characterized in that the value of the proportional network voltage ( $V_{AC}'$ ) is obtained from the equation:

$$V_{AC}' = f\left(\frac{\partial V_0}{\partial t}\right)$$

30 wherein  $\partial V_0$  is obtained by subtracting the first and second measurements of level ( $V_{t10}$ ,  $V_{t20}$ ), and the value of  $t$  is obtained by subtracting the values of

the first and second moments of measurement ( $t_{10}$ ,  $t_{20}$ ).

5. A method according to claim 3, characterized in that after the step of obtaining the value of proportional network voltage ( $V_{AC}'$ ) one foresees a step of:

- 5                   - measuring the lag time ( $t_D$ ) between the occurrence of the measurement of the first moment of measurement ( $t_{10}$ ) and the occurrence of the measurement of the second moment of measurement ( $t_{20}$ ),  
                    - comparing the lag time ( $t_D$ ) with a pre-established time ( $t_P$ ),  
                    - altering the value of the total voltage ( $V_T$ ) proportionally to the  
10 value of the proportional network voltage ( $V_{AC}'$ ), the value of proportional network voltage ( $V_{AC}'$ ) being proportional to the lag time ( $t_D$ ), when the lag time ( $t_D$ ) is different from a pre-established time ( $t_P$ ).

6. A method according to claim 5, characterized in that the pre-established time corresponds to the lag time ( $t_D$ ) of the previous cycle of the  
15 network voltage ( $V_{AC}$ ).

7. A method according to claim 6, characterized in that the in the step of altering the total voltage ( $V_T$ ) the elevation of the total voltage ( $V_T$ ) if the lag time ( $t_D$ ) is longer than the pre-established time ( $t_P$ ) is foreseen.

8. A method according to claim 7, characterized in that in the  
20 step of altering the total voltage ( $V_T$ ) the diminution of the total voltage ( $V_T$ ) if the lag time ( $t_D$ ) is shorter than the pre-established time ( $t_P$ ) is foreseen.

9. A method according to claim 8, characterized in that the value of the total voltage ( $V_T$ ) corresponds to a difference between the value of the piston voltage ( $V_P$ ) and the value of the proportional network voltage ( $V_{AC}'$ ),  
25 the value of the piston voltage ( $V_P$ ) being previously established.

10. A method according to claim 1, characterized in that the total voltage ( $V_T$ ) feeds an electric motor of a compressor, the compressor comprising a piston.

11. An electric motor movement controlling method, the electric  
30 motor being fed by a total voltage ( $V_T$ ) proportional to the network voltage ( $V_{AC}$ ), the method being characterized by comprising the steps of:

- measuring the network voltage ( $V_{AC}$ ) at a first moment of meas-

urement ( $t_{10}$ );

- measuring the network voltage ( $V_{AC}$ ) at a second moment of measurement ( $t_{20}$ ), the second moment of measurement ( $t_{20}$ ) being different from the first moment of measurement ( $t_{10}$ ) and the second measurement of the network voltage ( $V_{AC}$ ) being carried out at a voltage level different from the level of the first measurement of the network voltage ( $V_{AC}$ ),

- measuring a lag time ( $t_D$ ) between the occurrence of the measurement of the first moment of measurement ( $t_{10}$ ) and the occurrence of the measurement of the second moment of measurement ( $t_{20}$ ),

10       - comparing the lag time ( $t_D$ ) with the pre-established time ( $t_P$ ),  
      - altering the value of the total voltage ( $V_T$ ) proportionally to the value of the proportional network voltage ( $V_{AC}'$ ).

12. A method according to claim 11, characterized in that the pre-established time ( $t_P$ ) corresponds to the lag time ( $t_D$ ) of the previous cycle of the network voltage ( $V_{AC}$ ).

13. A method according to claim 11, characterized in that the pre-established time ( $t_P$ ) corresponds to a mean of lag times ( $t_D$ ) of the previous cycles of the network voltage ( $V_{AC}$ ).

14. A method according to any one of claims 12 or 13, characterized in that the value of the proportional network voltage ( $V_{AC}'$ ) is proportional to the lag time ( $t_D$ ).

15. A method according to claim 14, characterized in that, in the step of altering the total voltage ( $V_T$ ), it is foreseen to raise the total voltage ( $V_T$ ) if the lag time ( $t_D$ ) is longer than the pre-established time ( $t_P$ ).

16. A method according to claim 15, characterized in that, in the step of altering the total voltage ( $V_T$ ), it is foreseen to lower the total voltage ( $V_T$ ) if the lag time ( $t_D$ ) is shorter than the pre-established time ( $t_P$ ).

17. A method according to claim 16, characterized in that the value of the total voltage ( $V_T$ ) corresponds to a difference between the value of a piston voltage ( $V_P$ ) and the value of the proportional network voltage ( $V_{AC}'$ ), the value of the piston voltage ( $V_P$ ) being previously established.

18. An electric motor movement controlling system controlled by

an electronic control central (10), the system being characterized in that:

the electric motor is fed by a total voltage ( $V_T$ ) controlled by the electronic control central (10), the total voltage ( $V_T$ ) being proportional to a network voltage ( $V_{AC}$ ),

5 the electronic control central (10) comprises a voltage detecting circuit (50), the voltage detecting circuit (50) detects the network voltage ( $V_{AC}$ ),

the electronic control central (10) makes a first level measurement ( $V_{t10}$ ) of the network voltage ( $V_{AC}$ ) at a first moment of measurement ( $t_{10}$ ), and makes a second level measurement ( $V_{t20}$ ) of the network voltage ( $V_{AC}$ ) at a second moment of measurement ( $t_{20}$ ),

the electronic control central (10) calculates the value of the values of the network voltage ( $V_{AC}$ ) measured in function of the measurement times ( $t_{10}$ ,  $t_{20}$ ) measured and obtains a value of a proportional network voltage ( $V_{AC}'$ ),

the electronic control central (10) altering the value of the total voltage ( $V_T$ ) to a value of corrected total voltage ( $V_T'$ ), proportionally to the value of the proportional network voltage ( $V_{AC}'$ ).

19. A system according to claim 18, characterized in that the electronic control central (10) comprises a voltage detecting circuit (50) that measures the network voltage ( $V_{AC}$ ) at the established level of voltage ( $V_0$ ) at the first and second moments of measurement ( $t_{10}$ ,  $t_{20}$ ).

20. A system according to claim 19, characterized in that the first and second level measurements ( $V_{t10}$ ,  $V_{t20}$ ) are carried out, respectively, at a first level of the network voltage ( $V_{M1}$ ) and at a second level of the network voltage ( $V_{M2}$ ).

21. A system according to claim 20, characterized in that the voltage detecting circuit (50) comprises a first voltage detecting circuit (51) that detects the first level of the network voltage ( $V_{M1}$ ).

22. A system according to claim 21, characterized in that the voltage detecting circuit (50) comprises a second voltage detecting circuit (52) that detects the second level of the network voltage ( $V_{M2}$ ).

23. A system according to claim 22, characterized in that the first voltage detecting circuit (51) is adjusted for measuring the first level of the network voltage ( $V_{M1}$ ) at the time of the respective passage by a zero level.

24. A system according to claim 23, characterized in that the  
5 second voltage detecting circuit (52) is adjusted for measuring the second level of the network voltage ( $V_{M2}$ ), the second level of the network voltage ( $V_{M2}$ ) being located between the zero level of the network voltage ( $V_{AC}$ ) and a maximum level of the network voltage ( $V_{ACM}$ ).

25. A system according to claim 24, characterized in that the  
10 electronic control central (10) measures a lag time ( $t_D$ ) between the occurrence of the measurement of the first level of the network voltage ( $V_{M1}$ ) and the occurrence of the measurement of the second level of the network voltage ( $V_{M2}$ ), the measurements of the first and second levels of the network voltage ( $V_{M1}$ ,  $V_{M2}$ ) being carried out by the voltage detecting circuit (50), the  
15 electronic control central (10) comprising a time counting device that compares the lag time ( $t_D$ ) with a pre-established time ( $t_P$ ) and alters the total voltage ( $V_T$ ) proportionally to the lag time ( $t_D$ ).

26. A system according to claim 25, characterized in that the  
20 electronic control central (10) generates a value of a proportional network voltage ( $V_{AC'}$ ), value of voltage ( $V_{AC'}$ ) being proportional to the value of the lag time ( $t_D$ ), and the electronic control circuit (10) altering the value of the total voltage ( $V_T$ ) to a value of corrected total voltage ( $V_T'$ ) proportionally to the value of the proportional network voltage ( $V_{AC'}$ ) when the lag time ( $t_D$ ) is different from the pre-established time ( $t_P$ ).

25 27. A system according to claim 26, characterized in that the electronic control central (10) raises the value of the total voltage ( $V_T$ ) to a value of corrected total voltage ( $V_T'$ ) if the lag time ( $t_D$ ) is longer than the pre-established time ( $t_P$ ).

30 28. A system according to claim 27, characterized in that the electronic control central (10) lowers the value of the total voltage ( $V_T$ ) to a value of corrected total voltage ( $V_T'$ ) if the lag time ( $t_D$ ) is shorter than the pre-established time ( $t_P$ ).

29. A system according to claim 28, characterized in that the second voltage detecting circuit (51) signals the passage of the level of the network voltage ( $V_{AC}$ ) in the second level of voltage ( $V_{M2}$ ) through a voltage comparator (53), the voltage comparator (53) generating a square wave having a transition moment, the lag time ( $t_D$ ) being measured between the occurrence of the first level of the network voltage ( $V_{M1}$ ) and the transition moment.

30. A system according to claim 29, characterized in that the total voltage ( $V_T$ ) feeds an electric motor of a compressor, the compressor comprising a piston,

10 the electronic control central (10) comprising a value of defined voltage ( $V_P$ ), the defined voltage ( $V_P$ ) being proportional to an error ( $E_{DP}$ ) between a reference displacement position ( $DP_{REF}$ ) and a maximum displacement ( $DP_{MAX}$ ) of the piston,

the reference displacement position ( $DP_{REF}$ ) being proportional to the position of the piston in the compressor, and

the maximum displacement ( $DP_{MAX}$ ) being proportional to a desirable displacement of the piston in the compressor.

31. A system according to claim 30, characterized in that the signal generating circuit (50) comprise a D/A converter.

20 32. A compressor having a system characterized by comprising a system such as defined in claims 18 to 30.